



Overview of California's Electricity System

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California Energy Commission
January 21 and 28, 2005**



Overview

- **What is unique about electricity?**
- **How much do we use?**
- **Where does it come from?**
- **Who does what in the system?**
- **Why are we talking about this?**



Electricity...





Electricity...

- **Instantaneous**
- **No storage**
- **Follows laws of physics**
- **Essential to our society**
- **Complex and Integrated system**



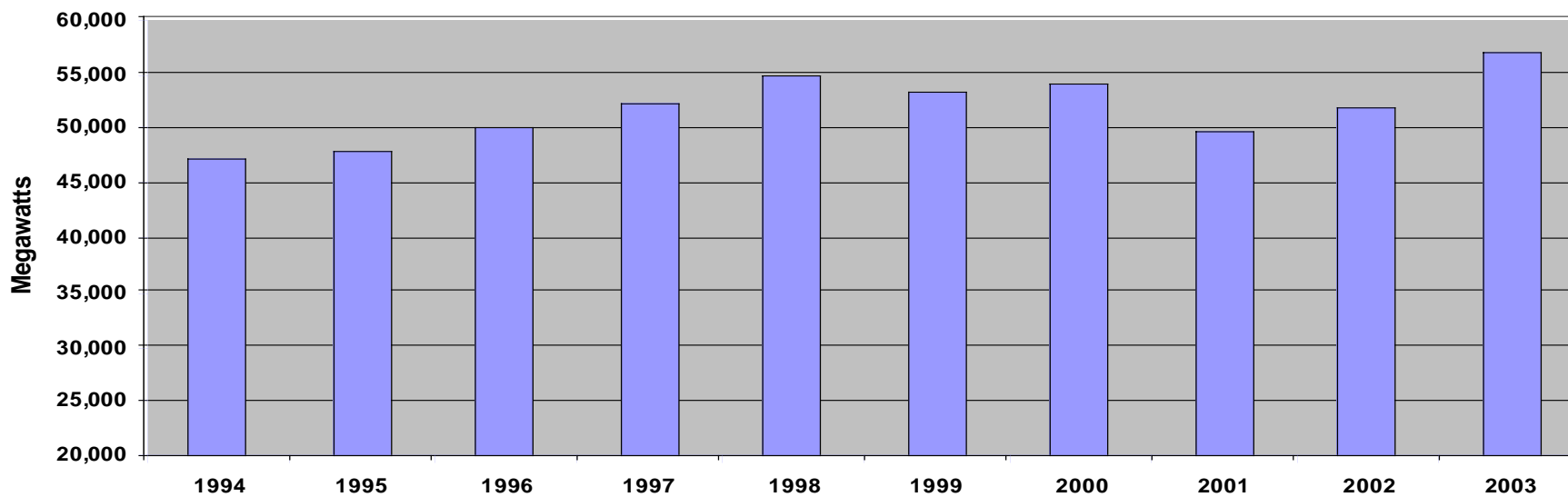
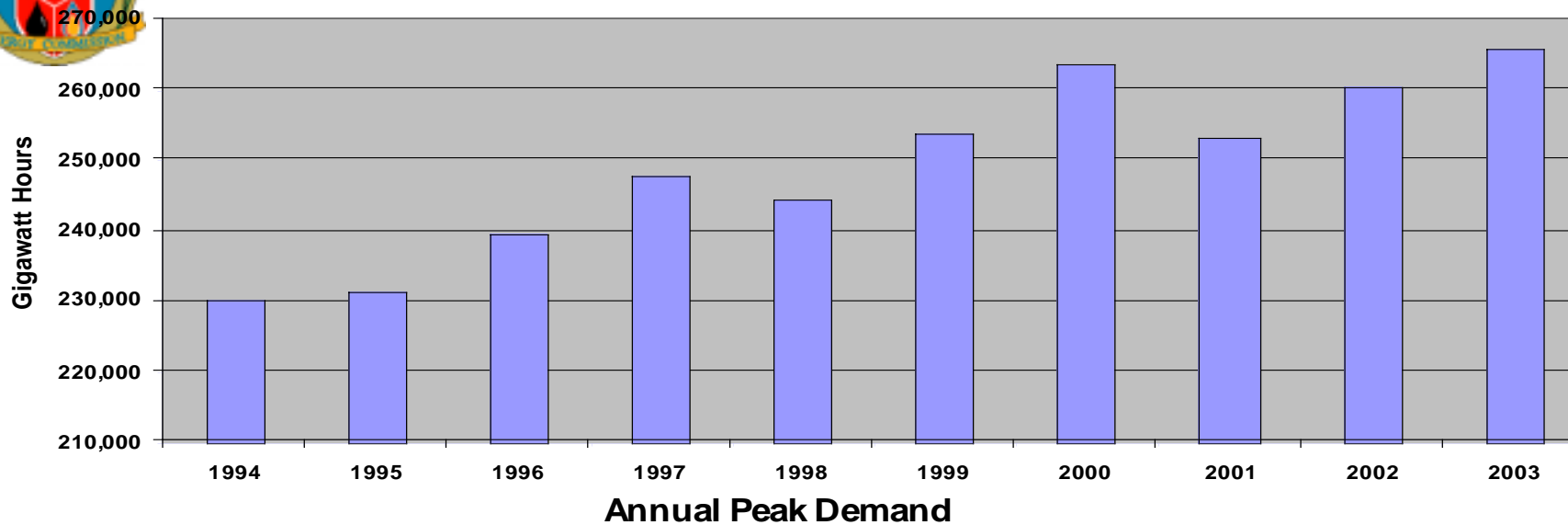
California's Electric System

- **12.9 million customers**
- **Average use - 624,000 megawatt hrs/day**
- **Peak demand - 56,714 megawatts (2004)**

- **Over 1,200 electrical generators**
- **Over 53,700 megawatts of capacity**
- **Over 38,000 miles of transmission lines**

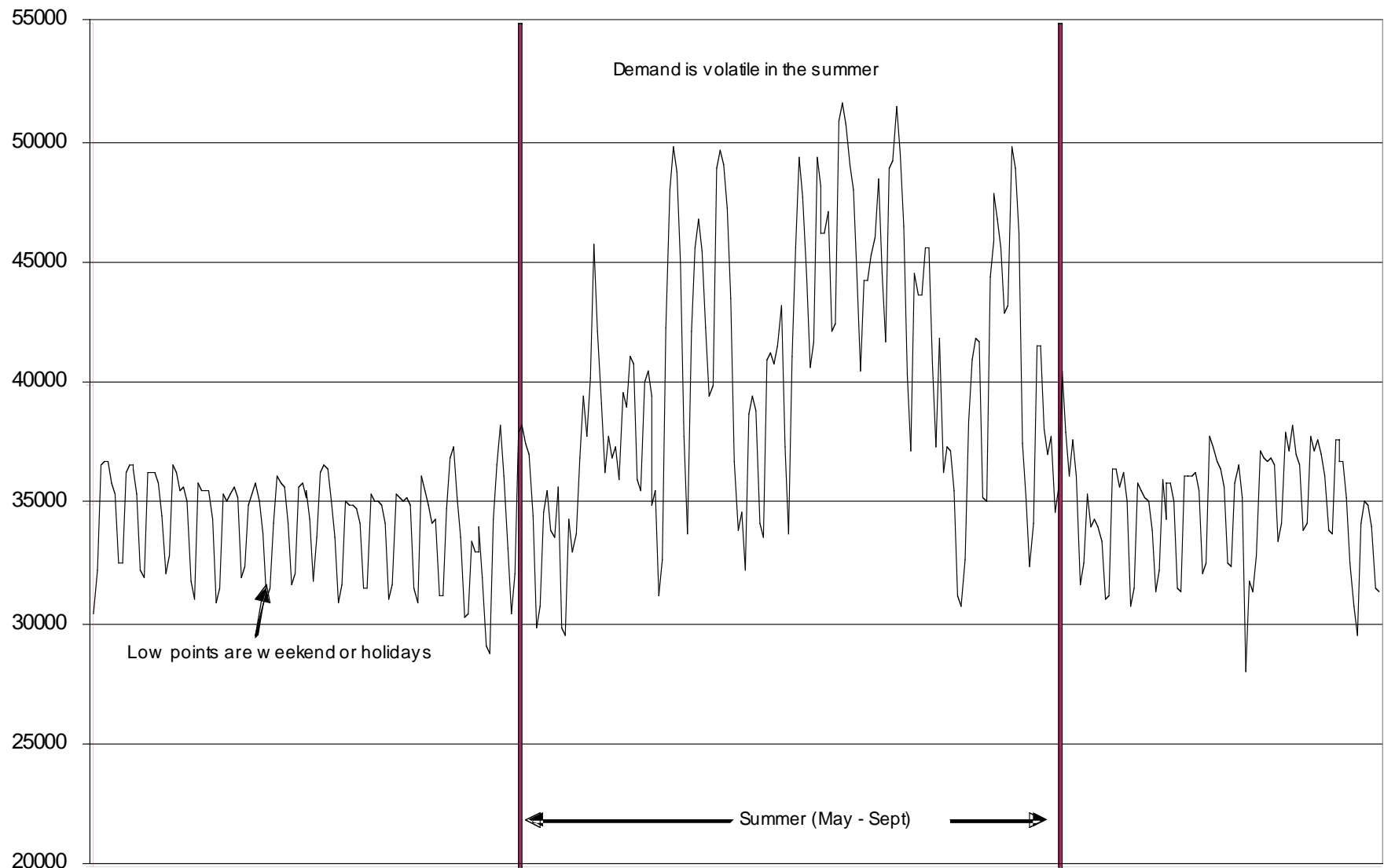


Annual Electricity Use - 1994-2003



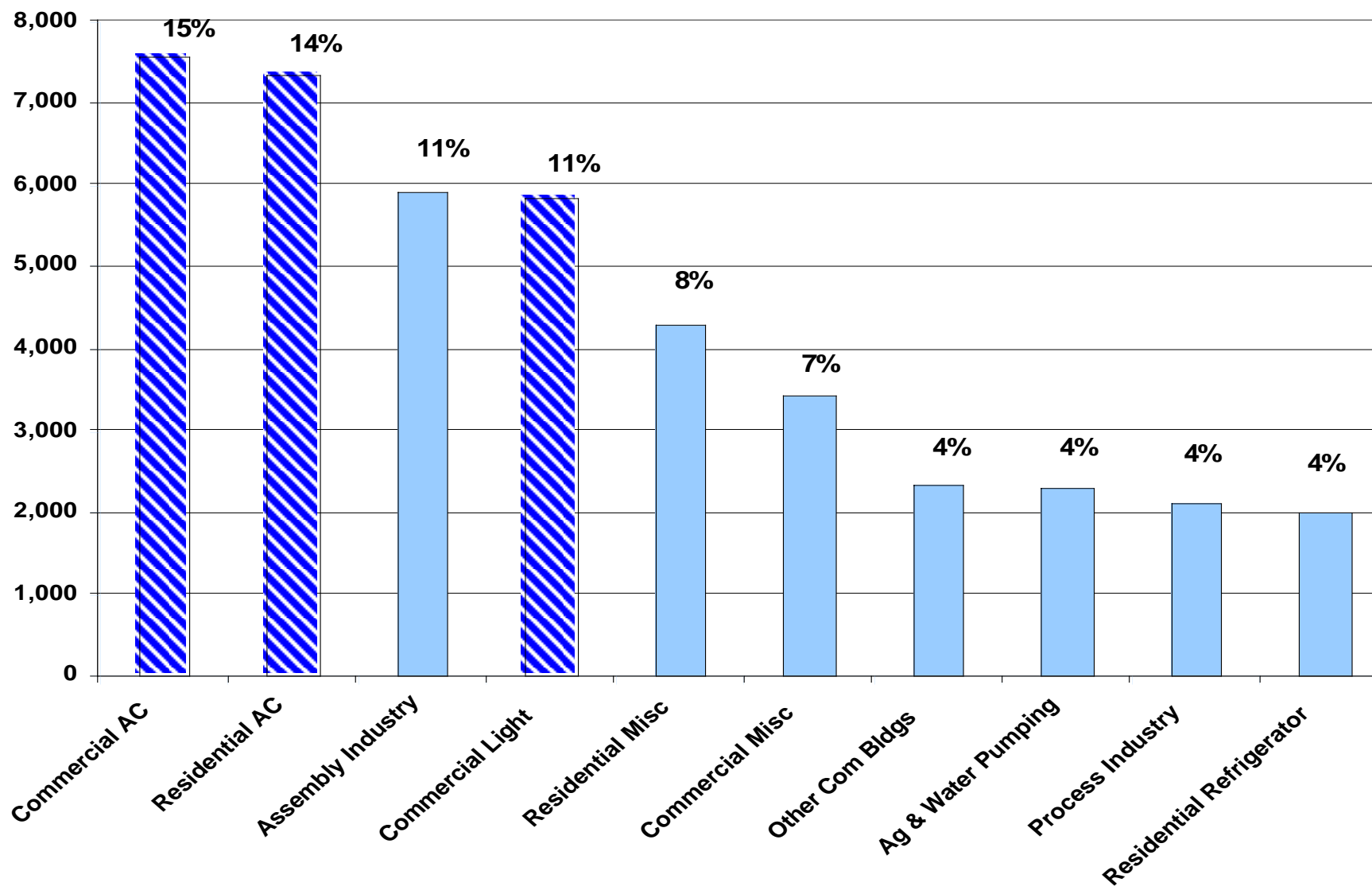


Patterns of Daily Peak Demand



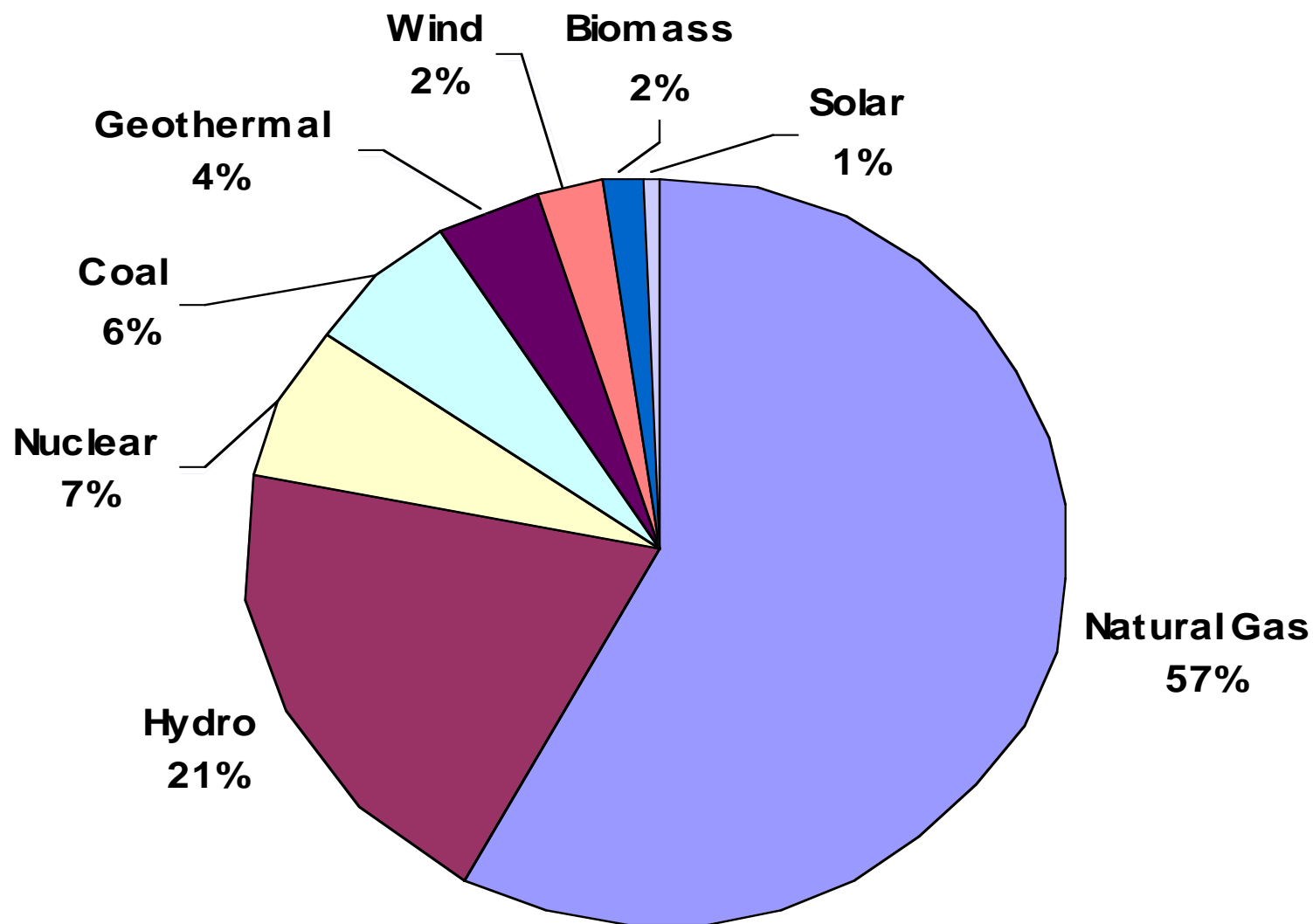


Peak Demand (MW) by End-Use



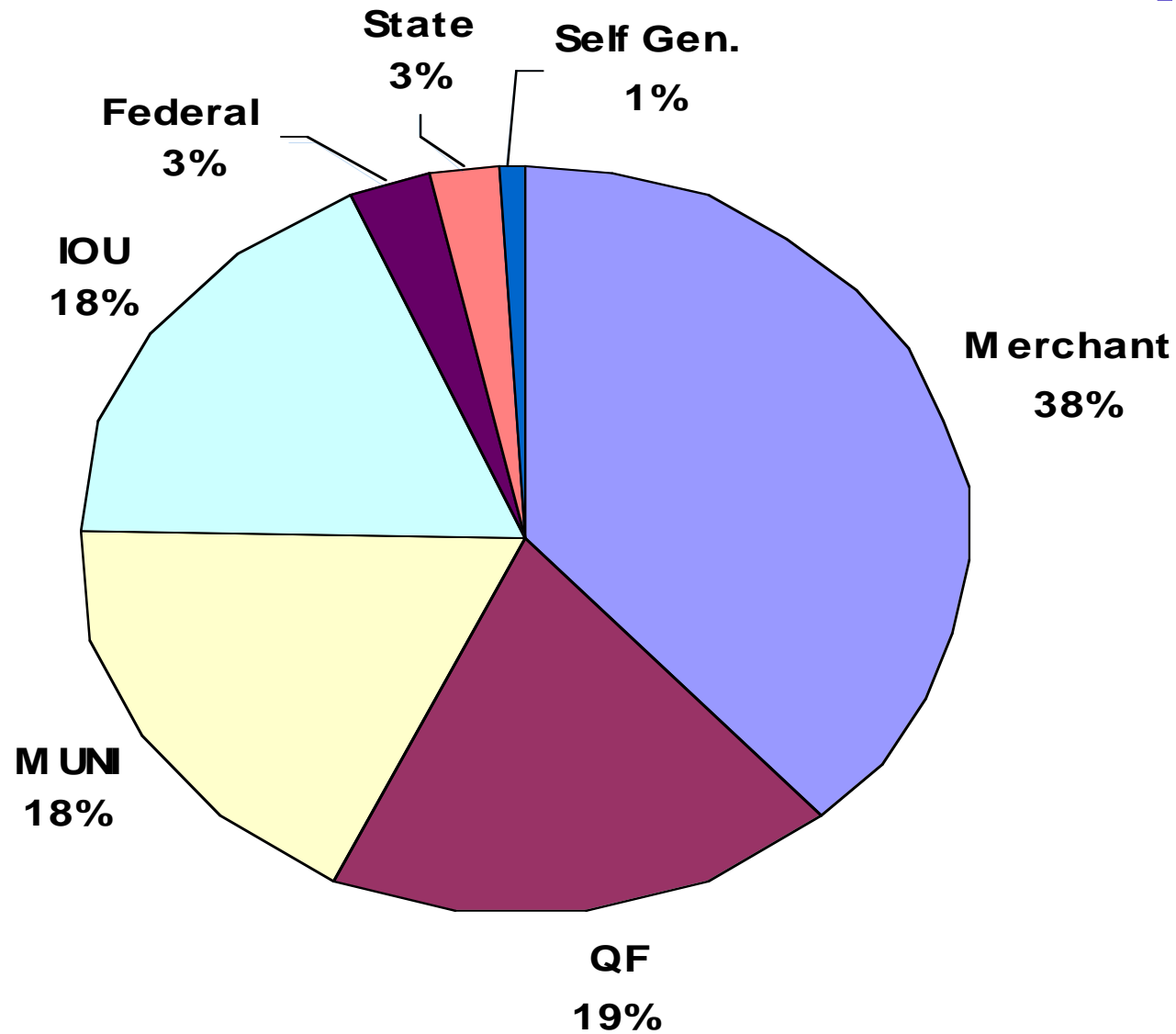


CA Generation Fuel Type





Generation Ownership





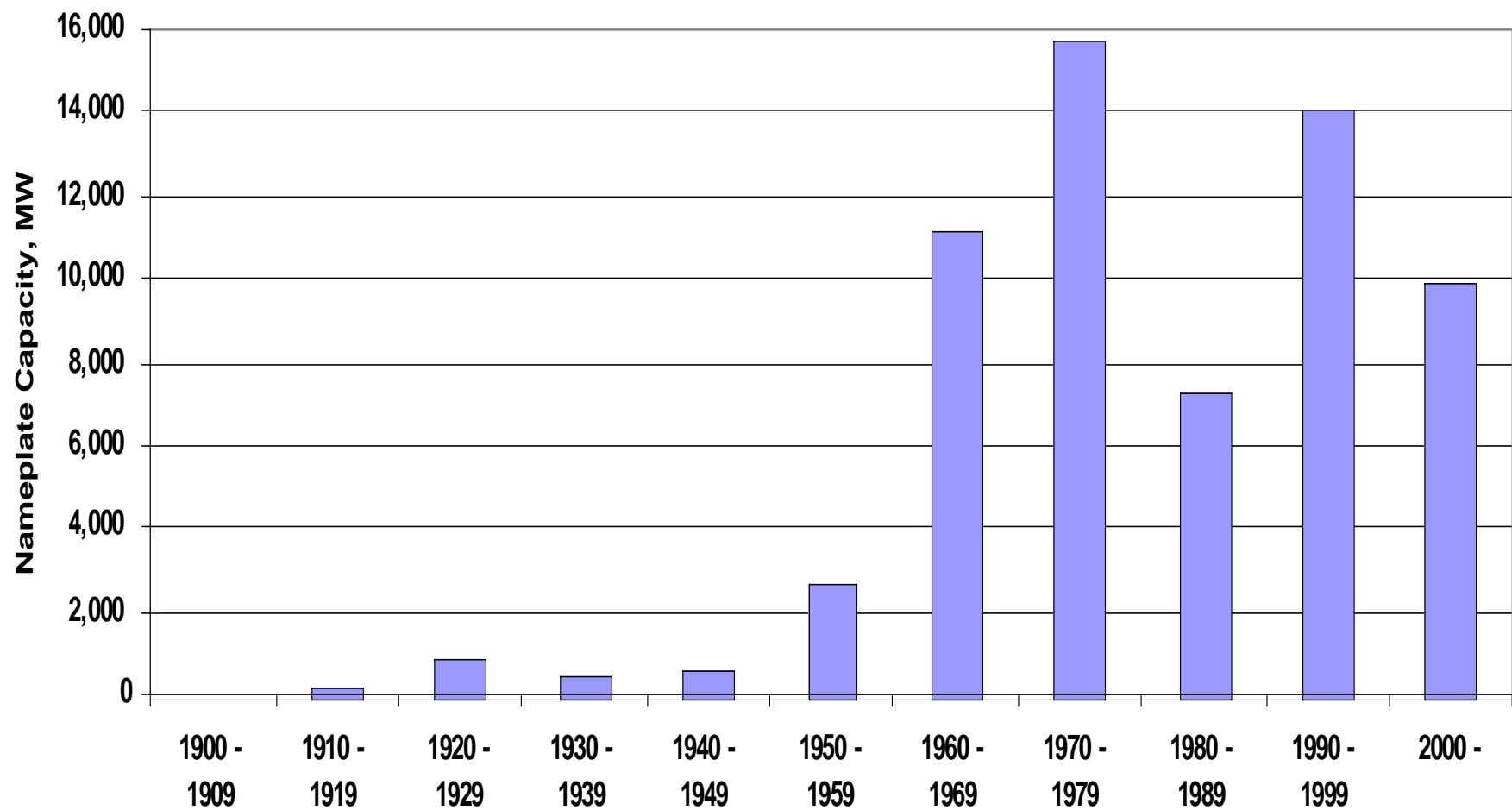
Aging Facilities

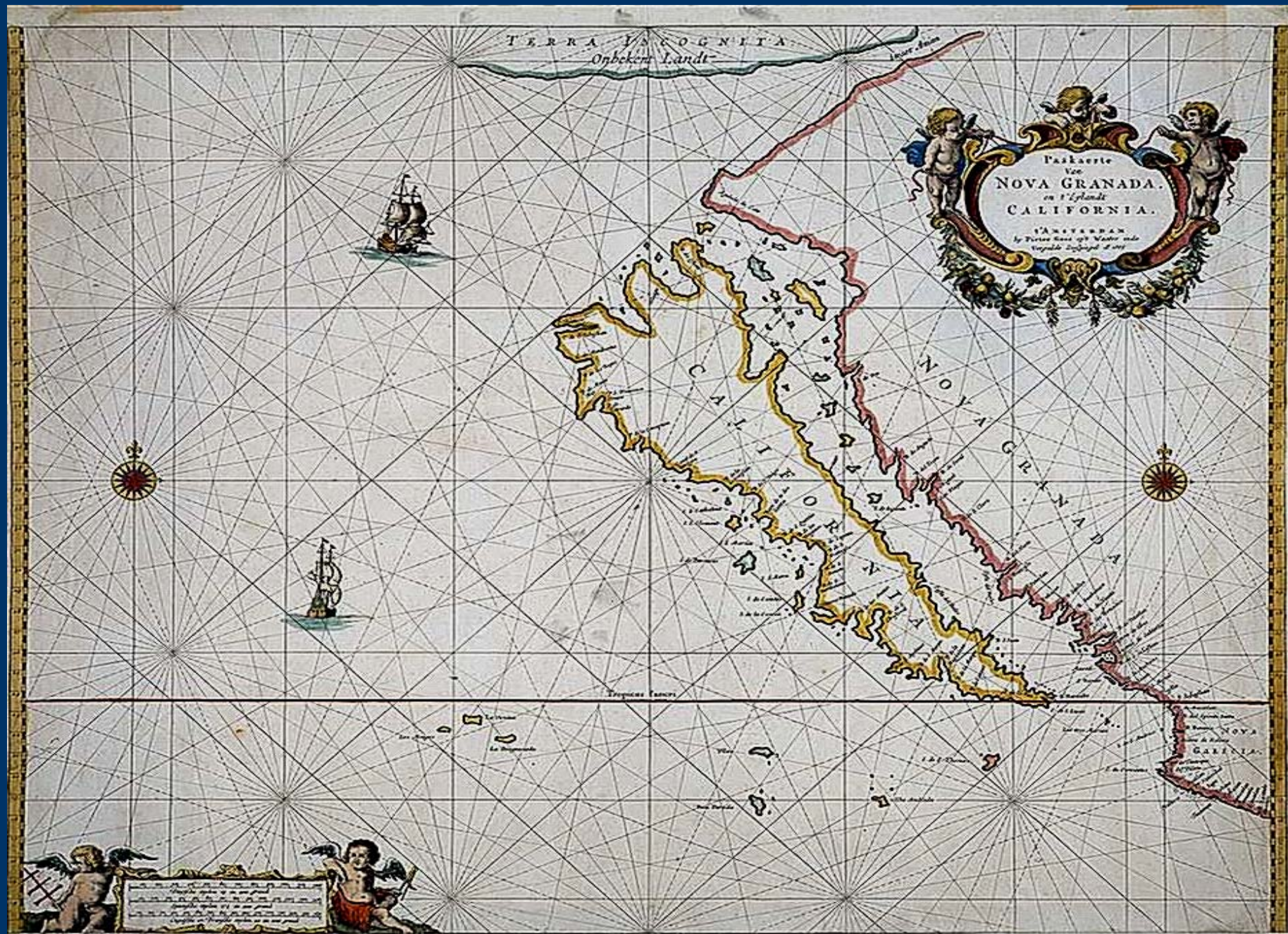
	Power Plants (#)	Power Plants (%)	Capacity (MW)	Capacity (%)
Total	971		53,000	
Over 40	128	13.2	17,200	32.1
Over 30	181	18.6	26,000	48.6



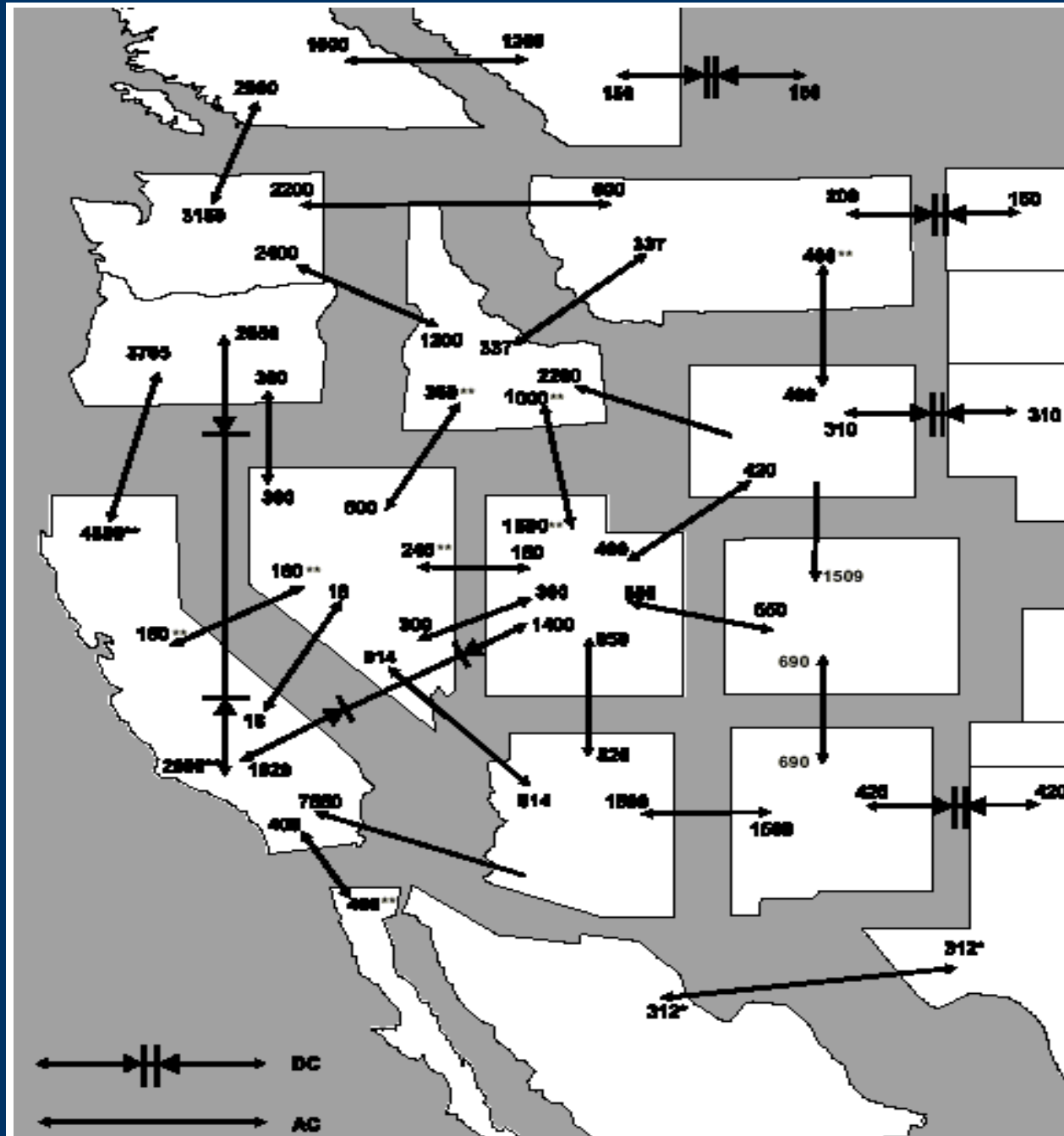
Aging Power Plants

Age of California Power Plants



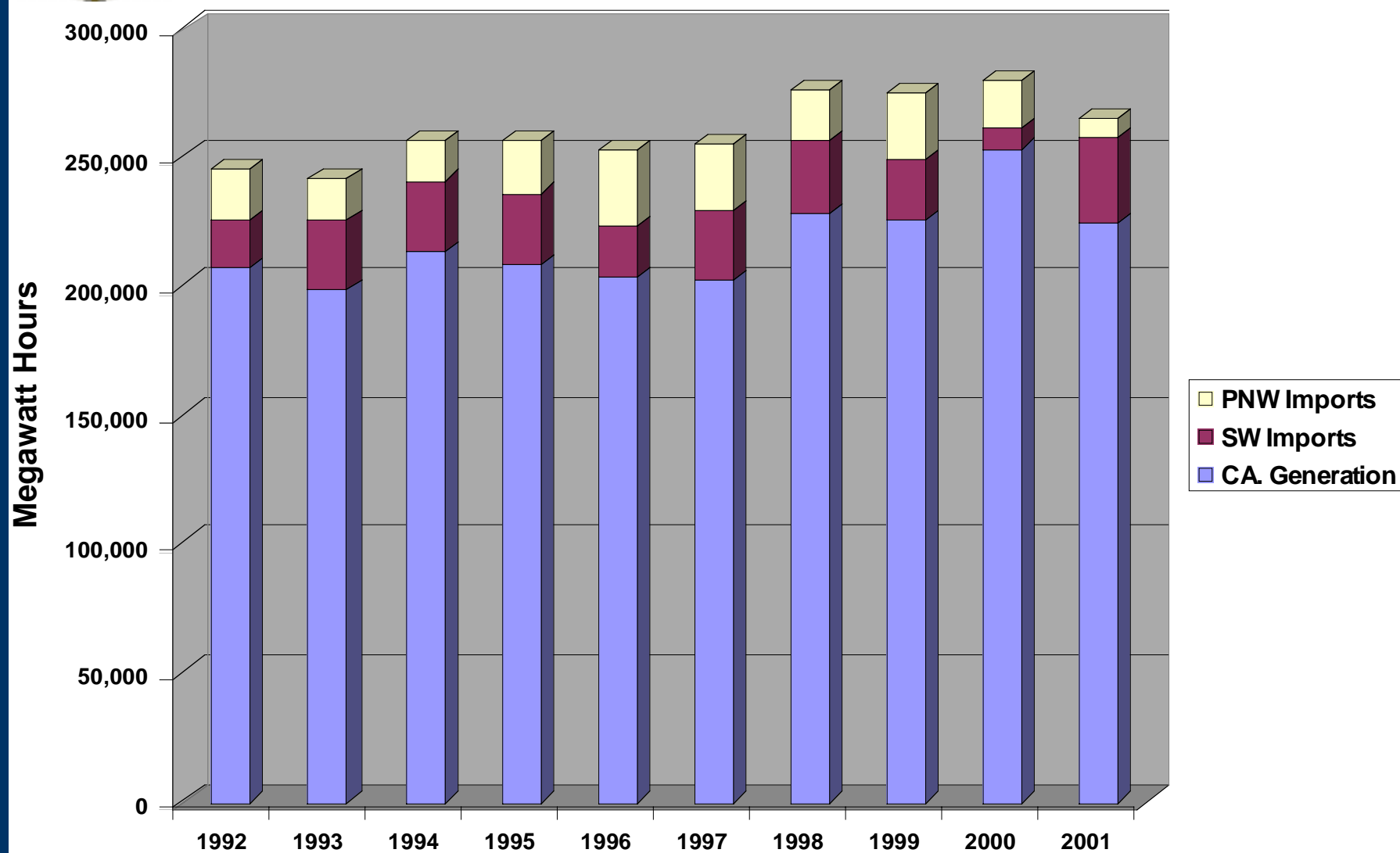


The Western Grid



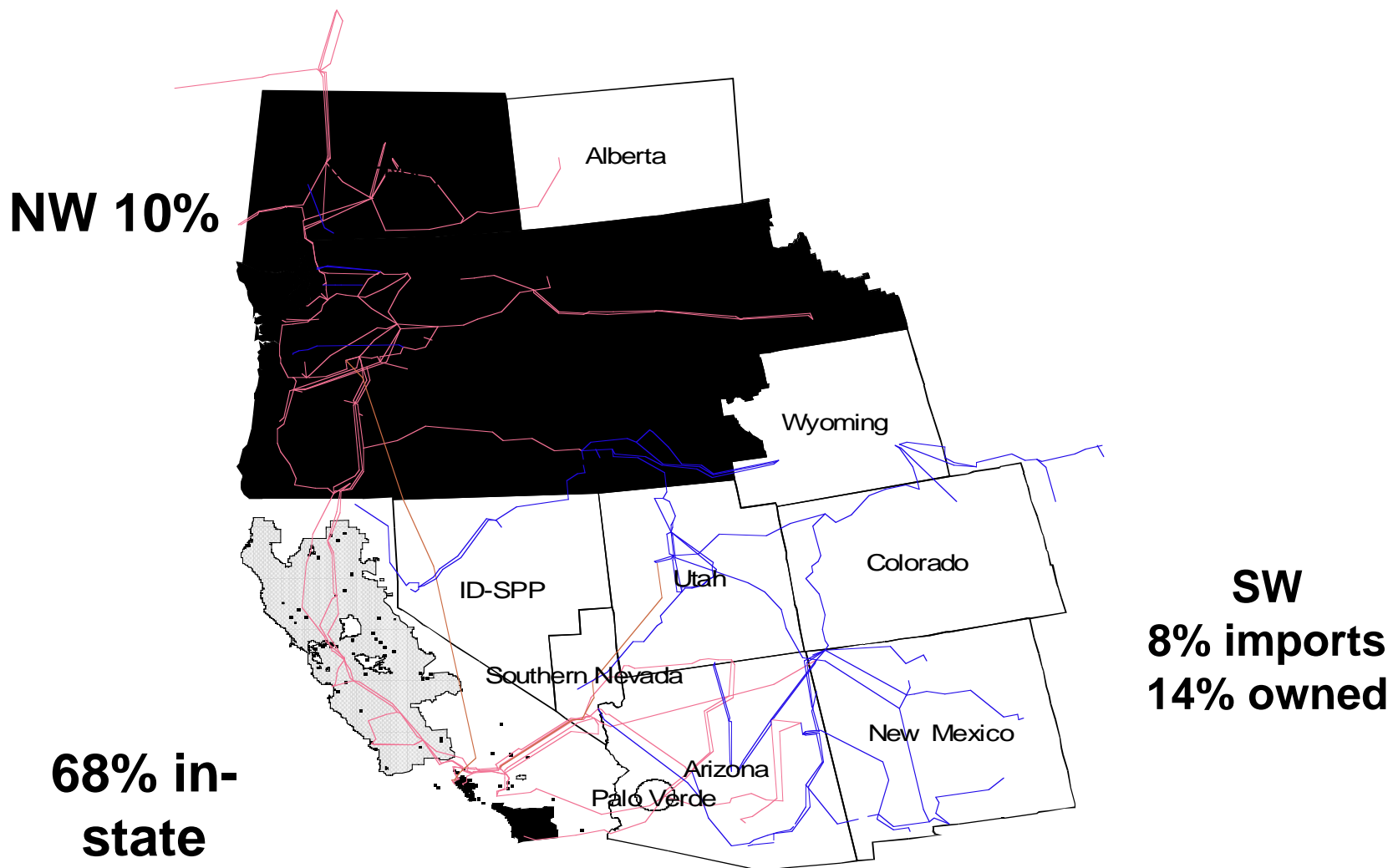


Generation and Imports

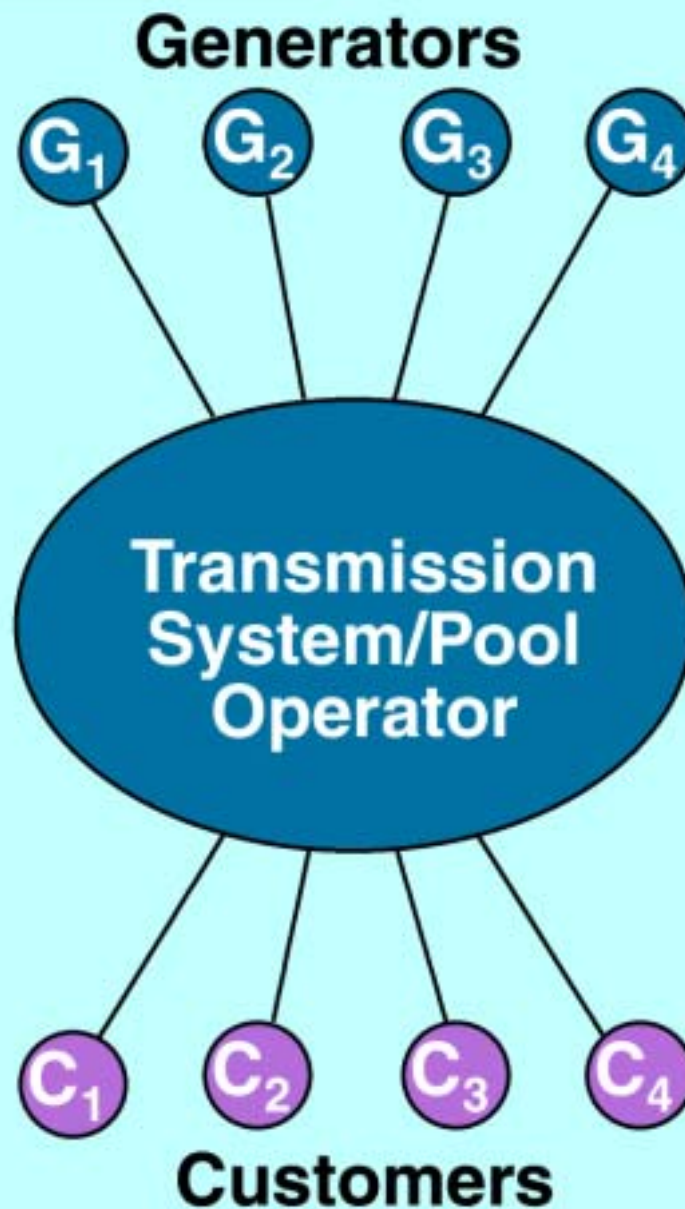




California's Power Sources



BASIC MARKET STRUCTURE

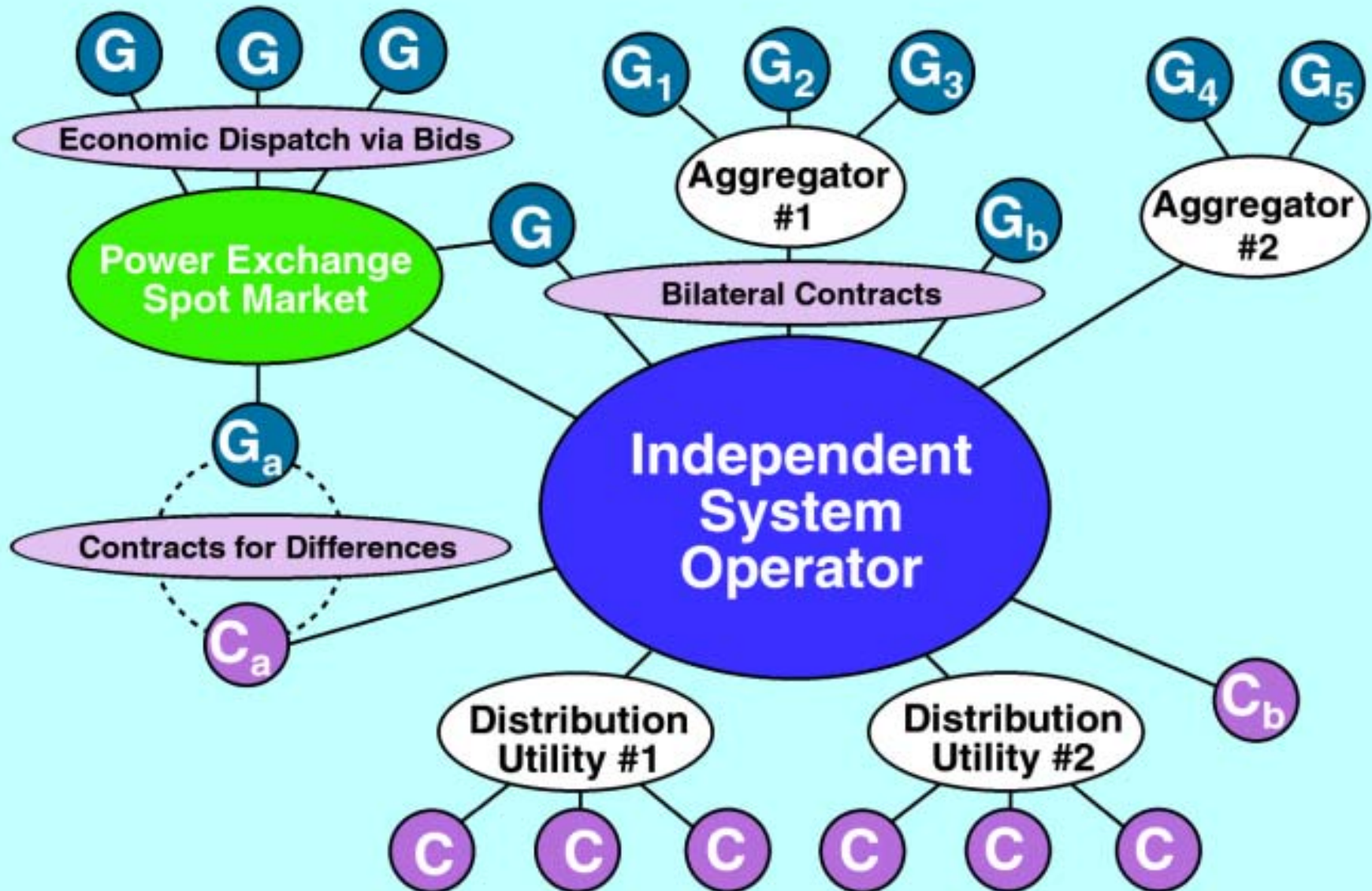




California Electric Industry Restructuring Act (AB 1890)

- **Signed September 1996**
- **Primary Goals**
 - **Increase competition**
 - **Reduce rates -- 10 to 20%**
 - **Maintain a reliable system**
- **Reliability - THE major concern**

COMPLETE MARKET STRUCTURE



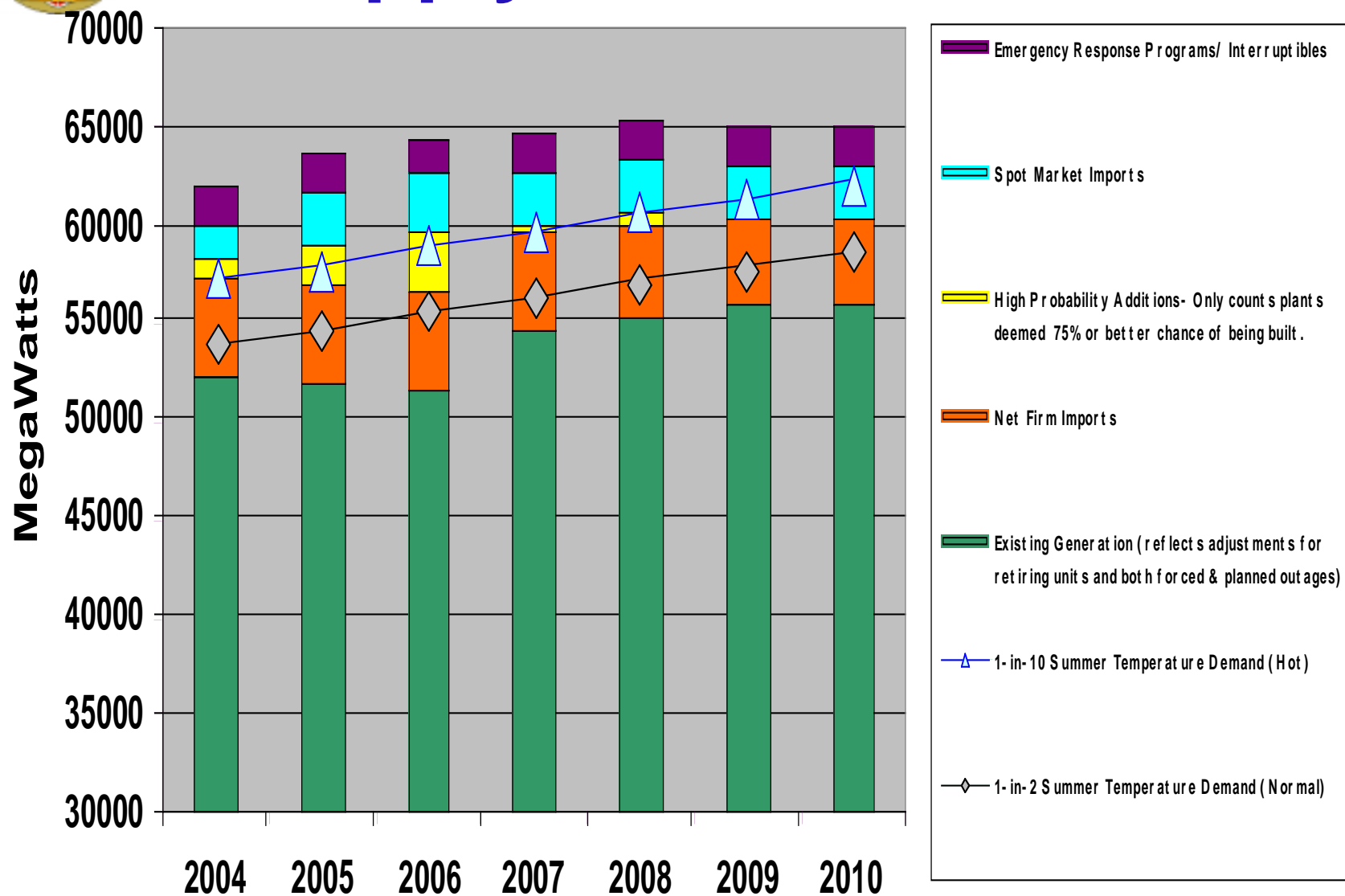


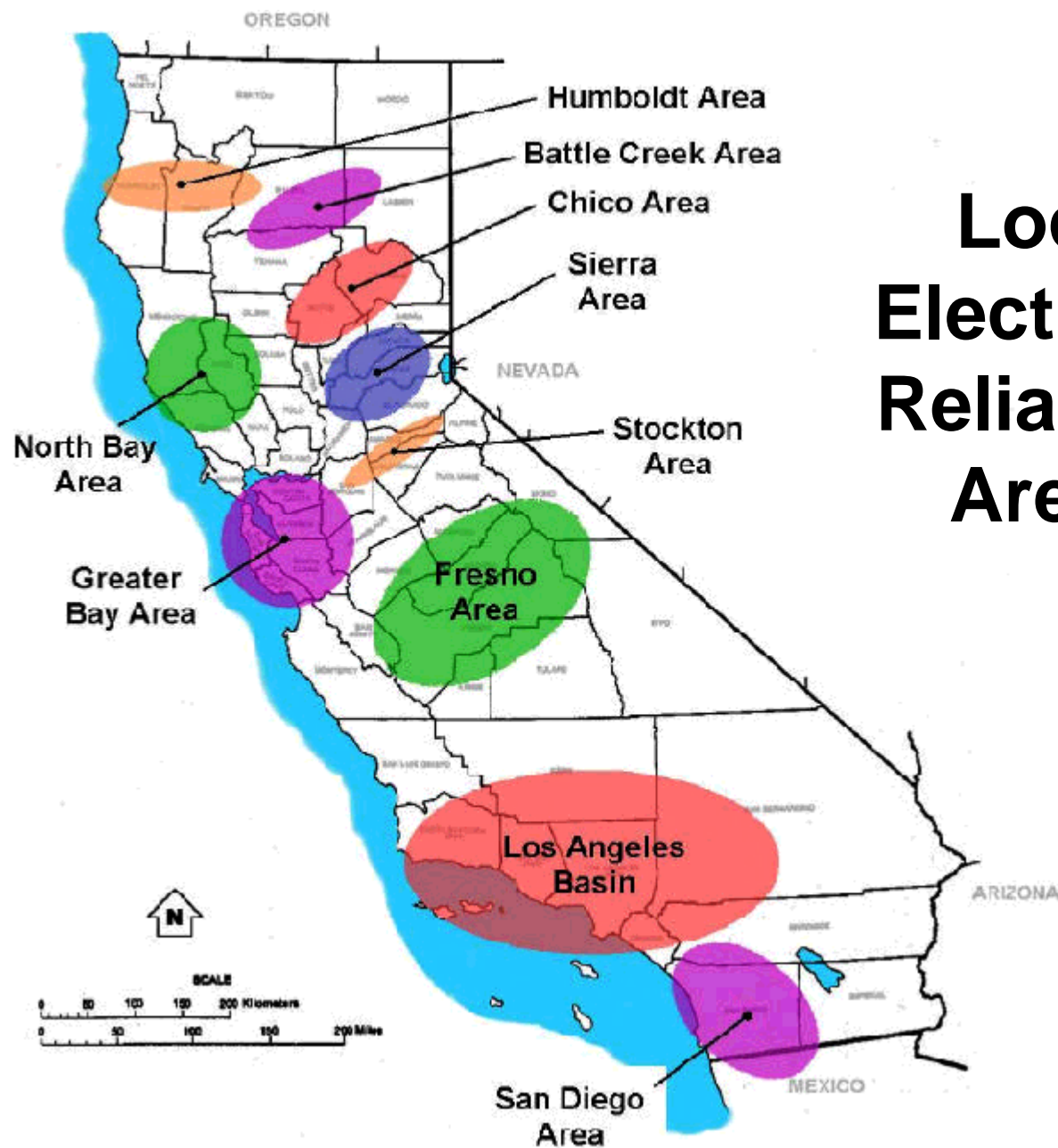
Energy “Agencies”

- **Public Utilities Commission** - rates, utility oversight
- **Energy Commission** - siting, forecasting, efficiency stds.
- **Electricity Oversight Board** - ISO oversight (reorg?)
- **Independent System Operator** - transmission operation
- **Power Exchange** - exchange forum (no longer exists)
- **Power Authority** – financing (no longer funded, reorg?)
- ***Federal Energy Regulatory Commission***
 - wholesale rates



Supply Demand Balance





Local Electricity Reliability Areas

2005 Monthly Outlook - SCE and SDG&E Service Territories

Line		<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>
1	Existing Generation ¹	20,154	20,120	20,249	20,249
2	Retirements (Known)				
3	Retirements (High Risk)	-676			
4	High Probability CA Additions	642	129		
5	Forced Outages ²	-1,200	-1,200	-1,200	-1,200
6	Zonal Transmission Limitation ²	-800	-800	-800	-800
7	Net Interchange ³	9,903	9,903	9,903	9,903
8	Total Supply (MW)	28,023	28,152	28,152	28,152
9	1-in-2 Summer Temperature Demand (Normal)	24,782	26,275	26,691	27,001
10	Projected Operating Reserve (1-in-2)**	21.8%	11.5%	8.7%	6.7%
11	1-in-10 Summer Temperature Demand (Hot)	26,214	27,793	28,233	28,561
12	Projected Operating Reserve (1-in-10)**	11.1%	2.0%	-0.4%	-2.2%
13	MW need to meet 7.0% Reserves in SP26	-667	893	1,364	1,715

14 Notes:

While preliminary, these numbers are suitable for projection/planning purposes and are best estimates as of Dec. 7, 2004.

"So. Calif." represents SCE and SDG&E service territories only.

** Does not reflect uncertainty for "Net Interchange" or "Forced Outages" which can result in significant variation in Operating Reserve.

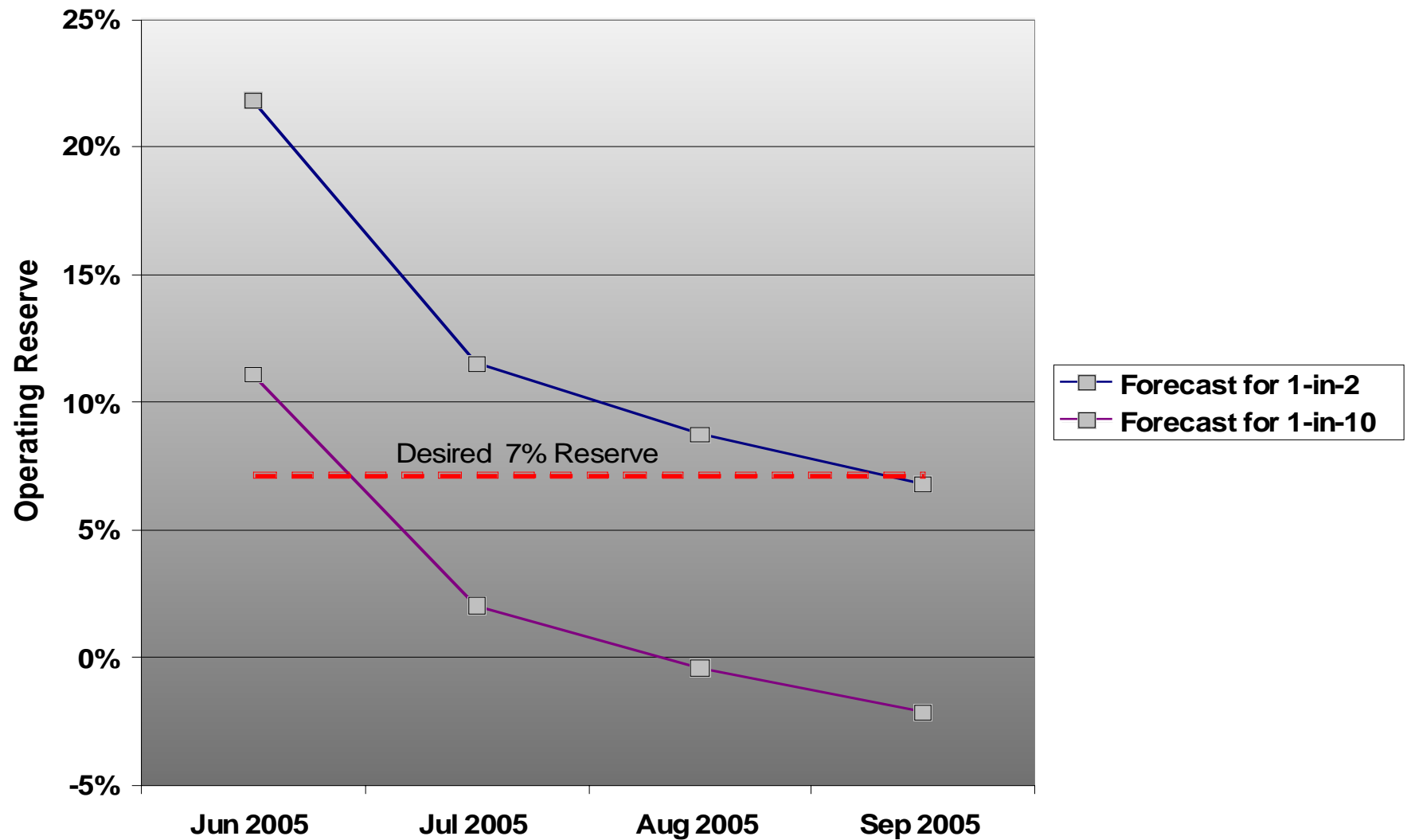
¹ Dependable capacity by station includes 1,080 MW of generation located South of Miguel

² CAISO-provided estimate.

³ 2004 CAISO estimate for DC imports of 1,500 MW; Path 26 2,700 MW; SW imports 2,500 MW; Dynamics 1,003 MW, plus CEC estimate of LADWP imports of 1,000 MW. 2005 estimate increases DC imports by 500 MW, Path 26 by 300 MW and South of Miguel by 400 MW.

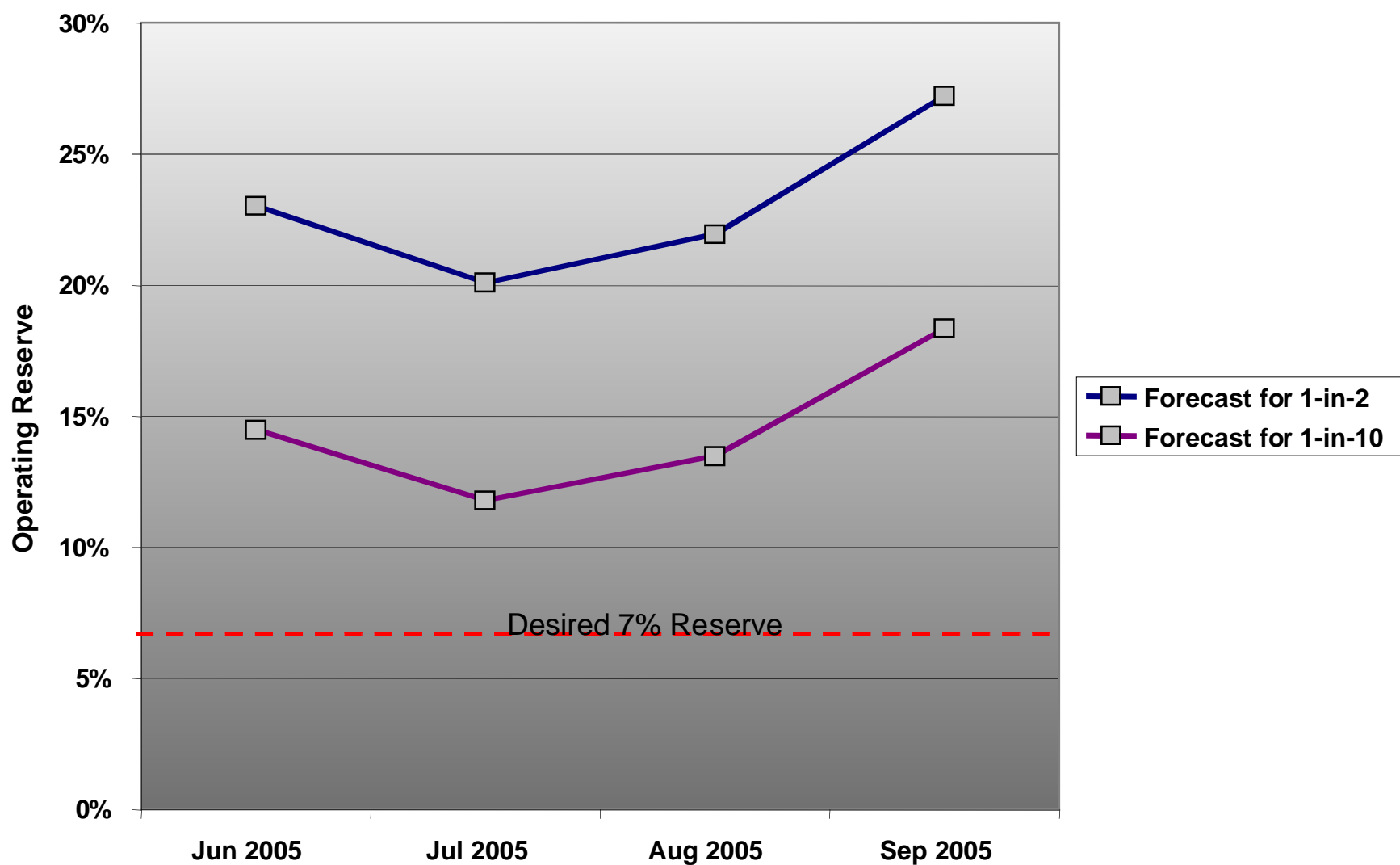


2005 Reserve – So. Cal.





2005 Reserve – No. Cal.





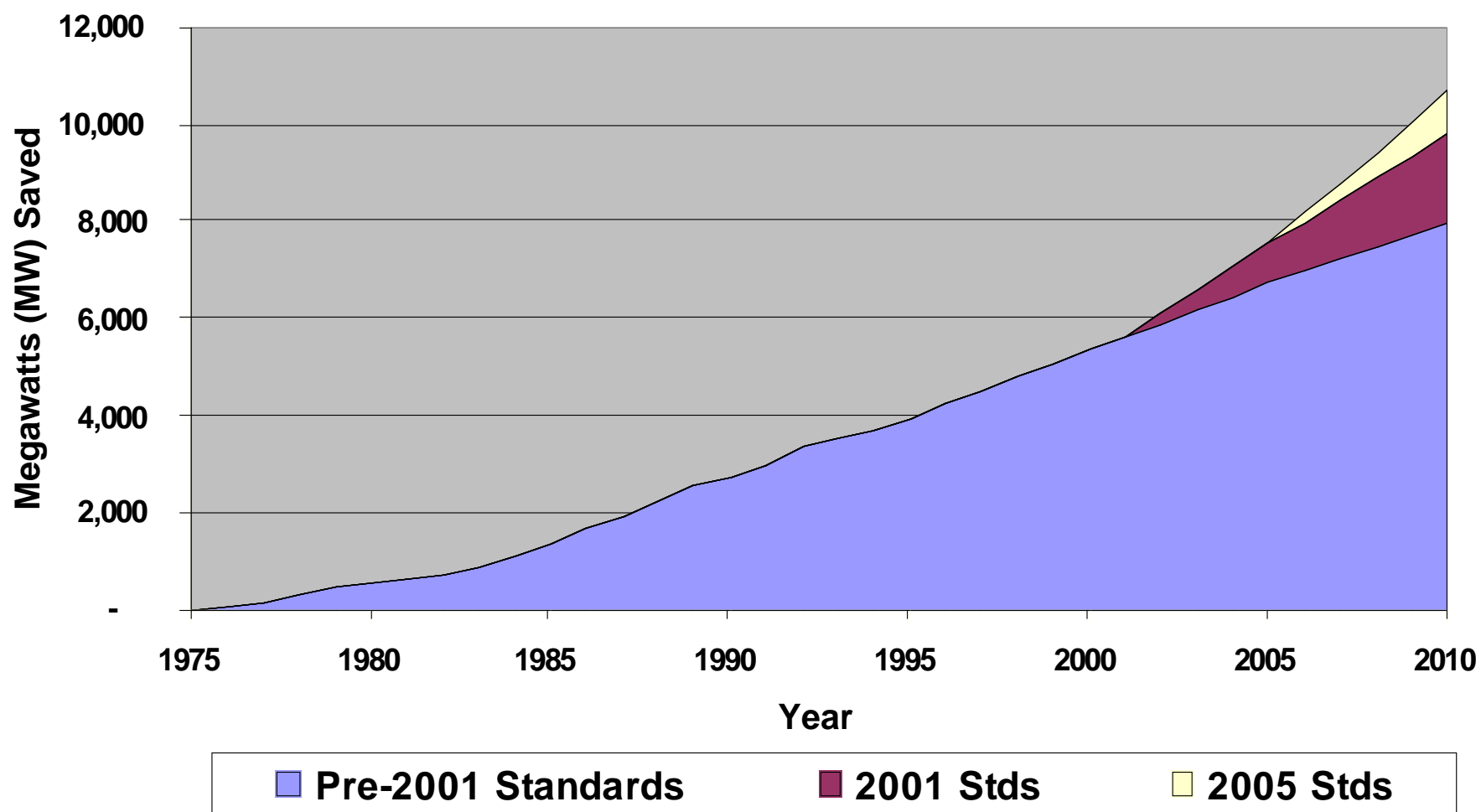
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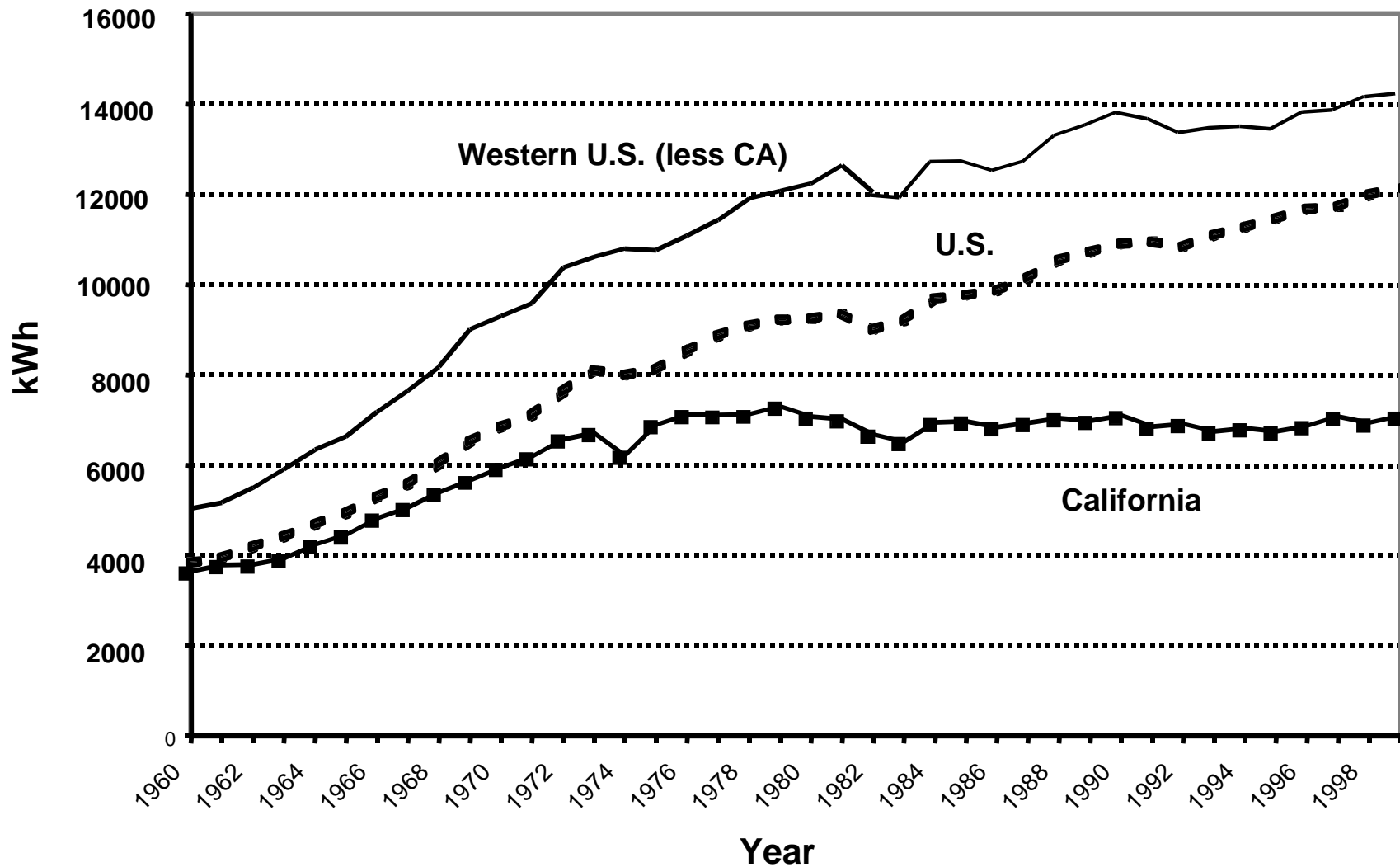
Energy Efficiency

Impact of the Energy Efficiency Standards



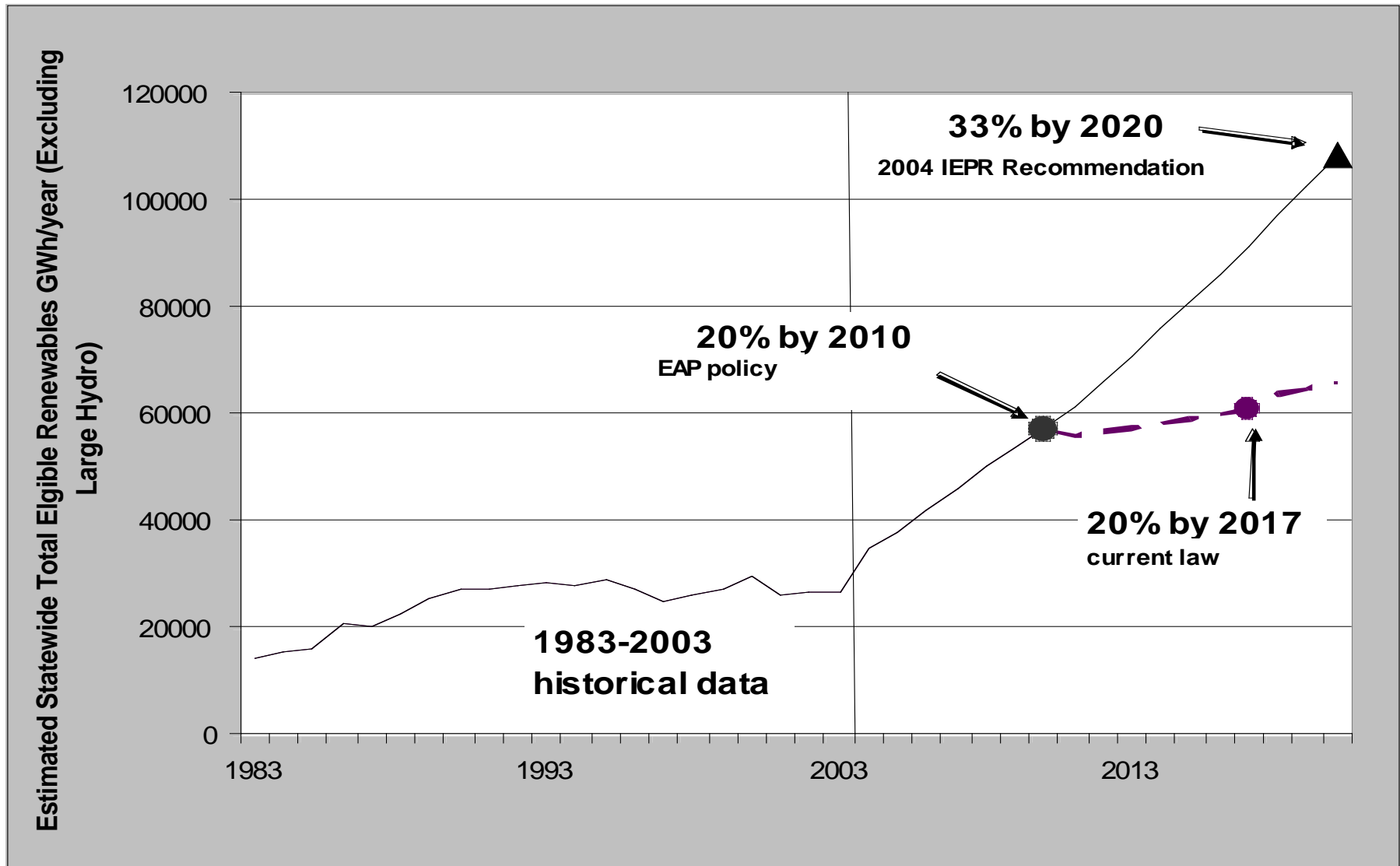


Total Electricity Use per Person (kWh)





Renewables





CALIFORNIA ENERGY COMMISSION



Power Plant Development

(since 1996)

Permitted Projects Status	Total	MW
Operational	24	8,311
Construction	13	5,189
Financing	1	185
On hold by developer	13	7,939
Canceled by developer	3	342
Total Projects Permitted	54	21,967
Total Projects Currently in Review	8	995

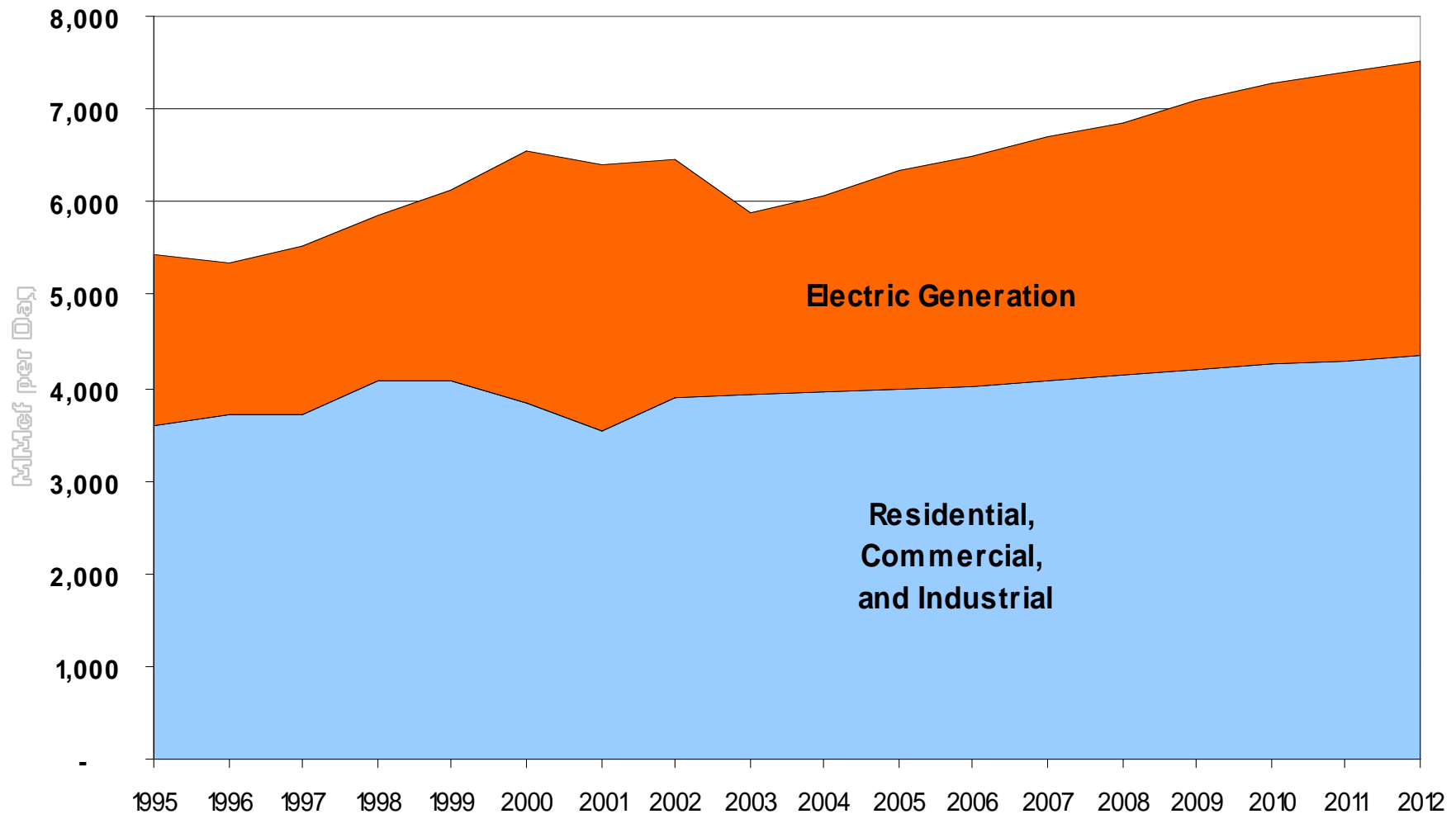


California's Air Quality



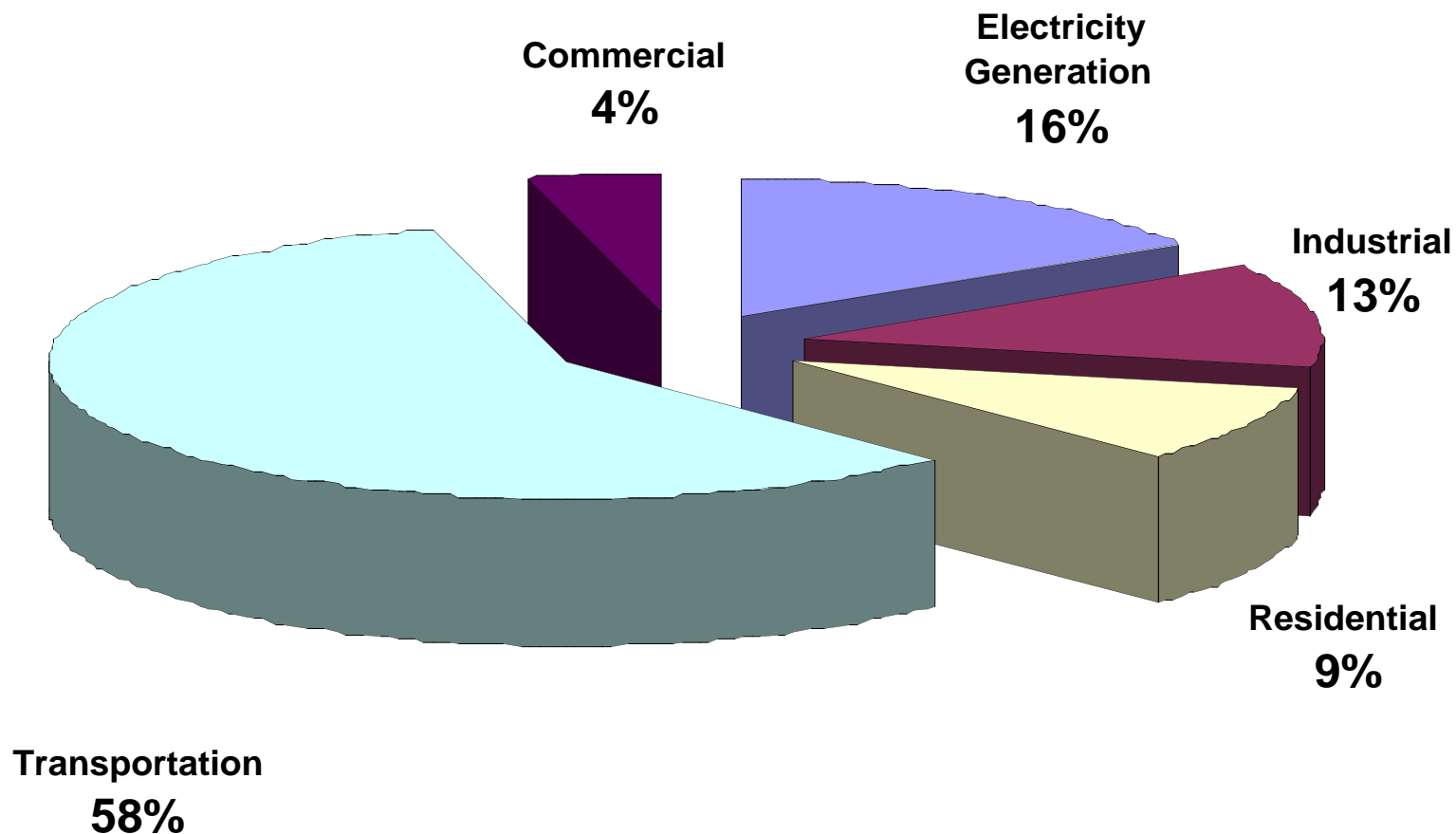


California's Natural Gas Use





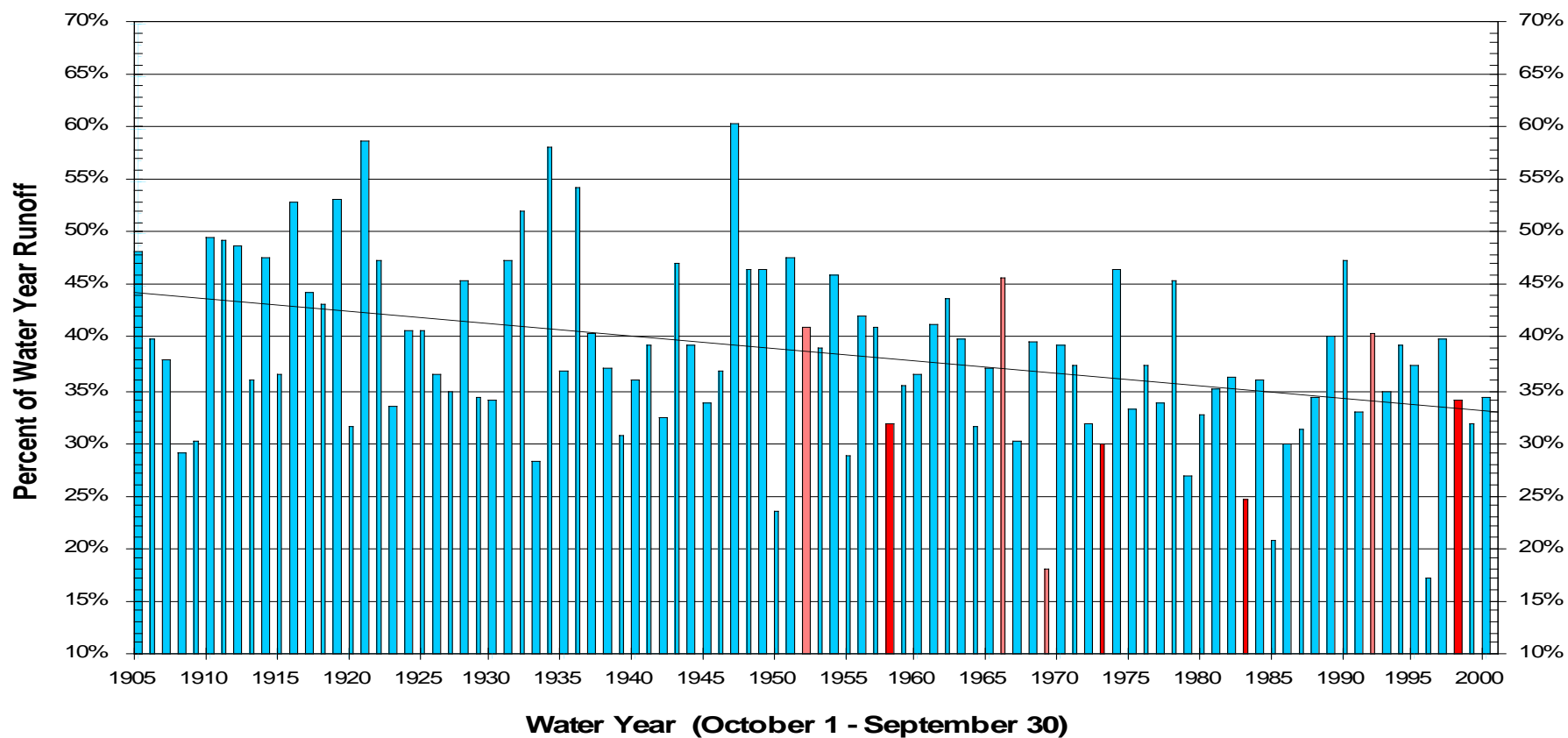
California CO₂ Sources



Source: Draft Greenhouse Gas Inventory Update, California Energy Commission, 2001



California Snow Pack



**Sacramento River Runoff (1906-2001)
April to July as a Percent of Total Runoff**

Source: Ca. Env. Protect. Agency, Environmental Protection Indicators for California, 2001



Electricity System Concerns

- **Growing demand in state (~2% per year)**
- **Growing demand in the west**
- **Potential retirement of older plants**
- **Delays building new power plants**
- **Growing dependence on one fuel**
- **Weaknesses in the transmission system**
- **Environmental and Env. Justice issues**
- **Long-term uncertainty**



Conclusion

- **There are plenty of challenges.**
- **We must act now for the short-term.**
 - **Encourage energy efficiency**
 - **Develop alternatives**
 - **Improve infrastructure**
- **We need a clear, stable, long-term plan.**